



# Big Tujunga Dam Seismic Rehabilitation and Spillway Modification Project

BIG TUJUNGA DAM No.1.  
11-26-30.  
E.C.EATON CHIEF ENGINEER



63 N 263.27-B

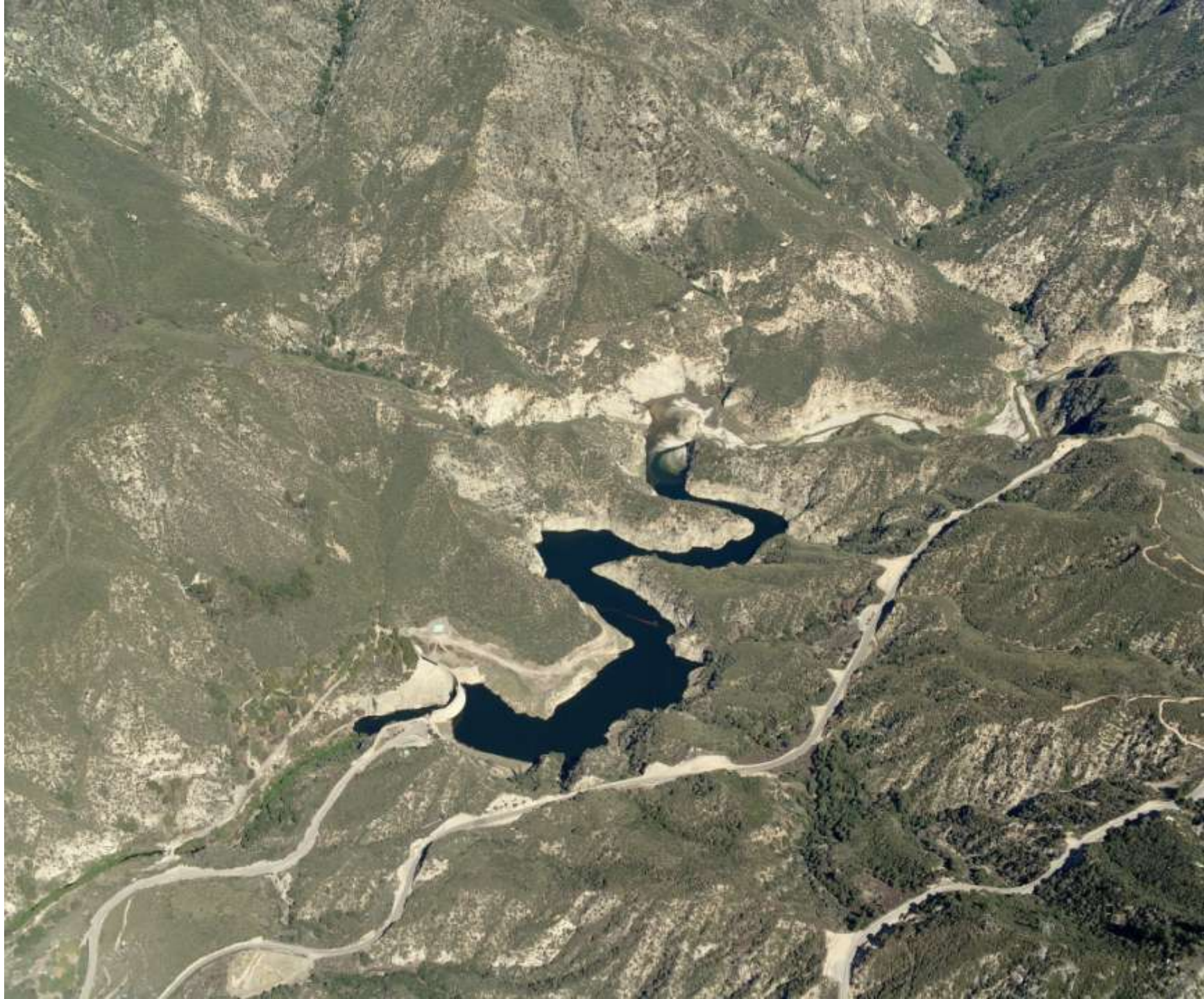
BIG TUJUNGA DAM No. 1  
JAN 26-1931.  
E.C. EATON CHIEF ENGINEER



63-136-5-6









# Flood Control Benefit

- Provides 85% peak reduction in 5 yr event
- Provides 80% peak reduction in 10 yr event
- Provides nominal reduction in Capital Flood
- Provides required protection for Departments Design Debris Event of 4,285ac-ft

# Seismic Restriction

- 1971 – Sylmar earthquake. Big T Dam performs satisfactorily. However, DSOD requires Public Works to perform seismic analysis of dams to ensure safety.
- 1976 – After preliminary analysis DSOD temporarily restricts Big T reservoir elevation to 2213 ft (77 ft below spillway) until proved safe or structurally modified to resist Maximum Credible Earthquake and pass Probable Maximum Flood.



# Inundation map

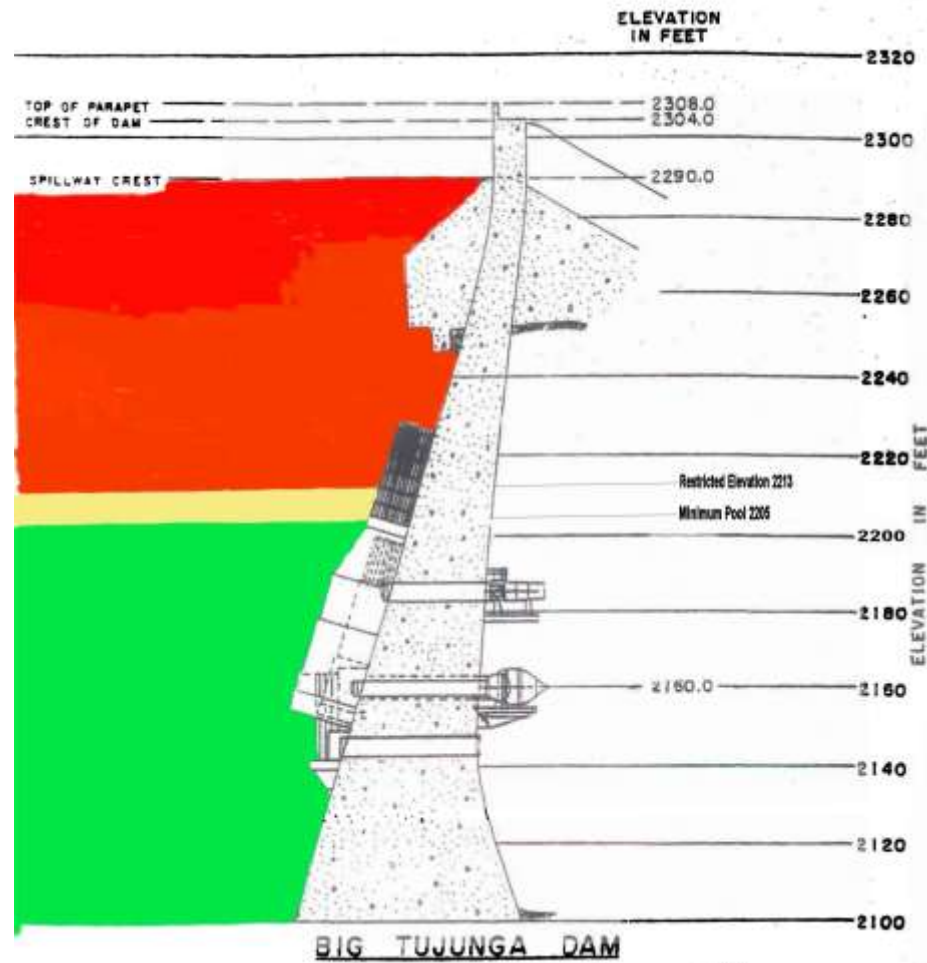


# State Division of Safety of Dams

- Dam does not meet DSOD requirement for structure to resist Maximum Credible Earthquake
- Dam does not meet DSOD requirement to safely pass the Probable Maximum Flood
- DSOD has restricted reservoir operation until deficiencies are addressed



# Restricted Operations

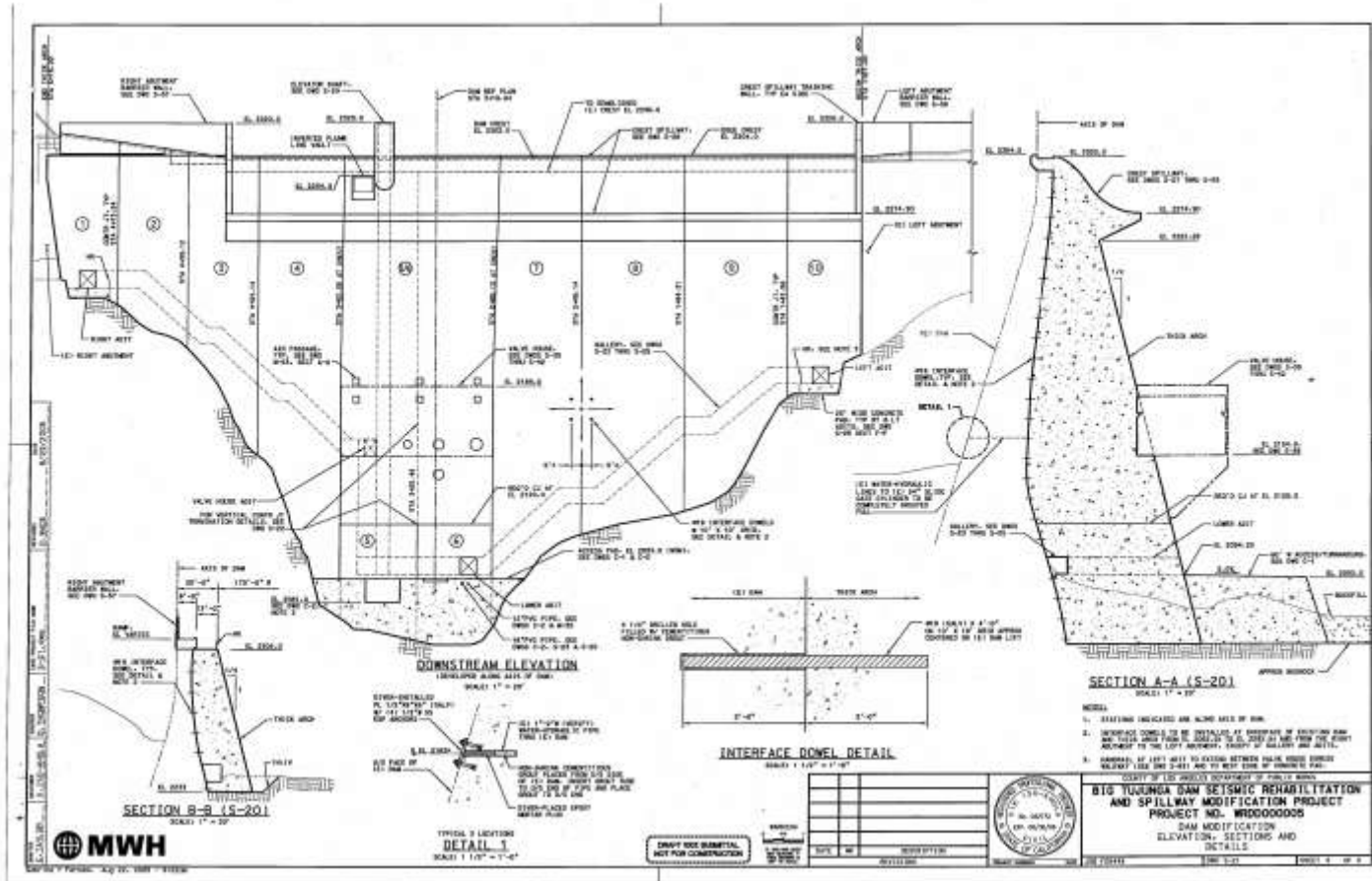


# Design

- Thickened Arch to resist seismic loads
- Central overtopping spillway and parapet walls to safely pass PMP
- Erosion protection measures
- New discharge valves
- New electrical / new generator
- New control house with seismic imp factor 1.25



# Rehabilitation Design Drawing



## January 2005 Spillway Flows





## January 2005 Spillway Flows



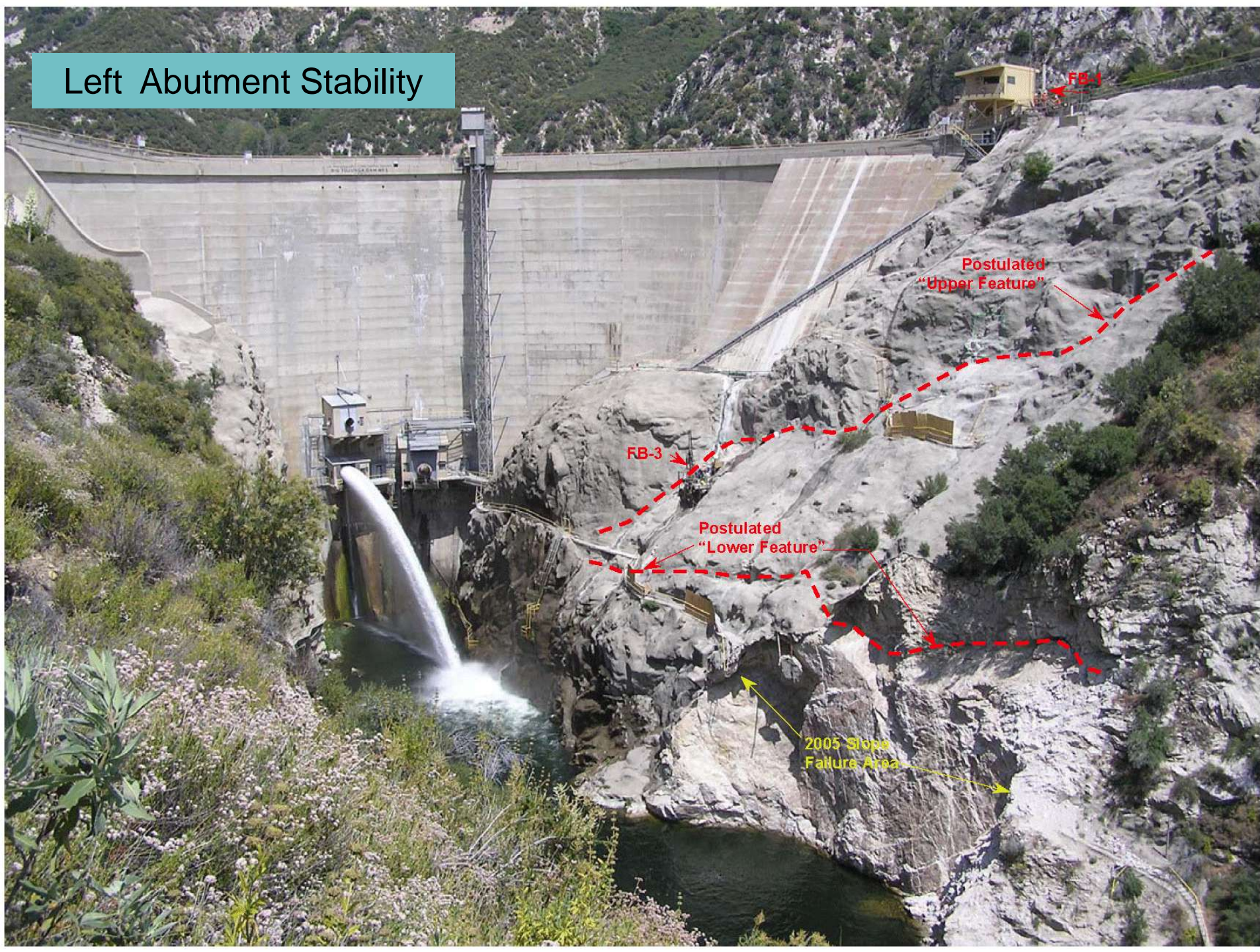




Rockfall Due to Plunge Pool Scour



## Left Abutment Stability





# Design

- Thickened Arch to resist seismic loads
- Central overtopping spillway and parapet walls to safely pass PMP
- Erosion protection measures
- **Abutment stability measures**
- New discharge valves
- New electrical / new generator
- New control house with seismic imp factor 1.25

# Environmental Enhancement



- Endangered Species Act (Santa Ana Sucker)
- Low Flow Valve to supplement dry season flow

# Design

- Thickened Arch to resist seismic loads
- Central overtopping spillway and parapet walls to safely pass PMP
- Erosion protection measures
- Abutment stability measures
- New discharge valves including low-flow valve to supplement stream flow and enhance habitat
- New electrical / new generator
- New control house with seismic imp factor 1.25



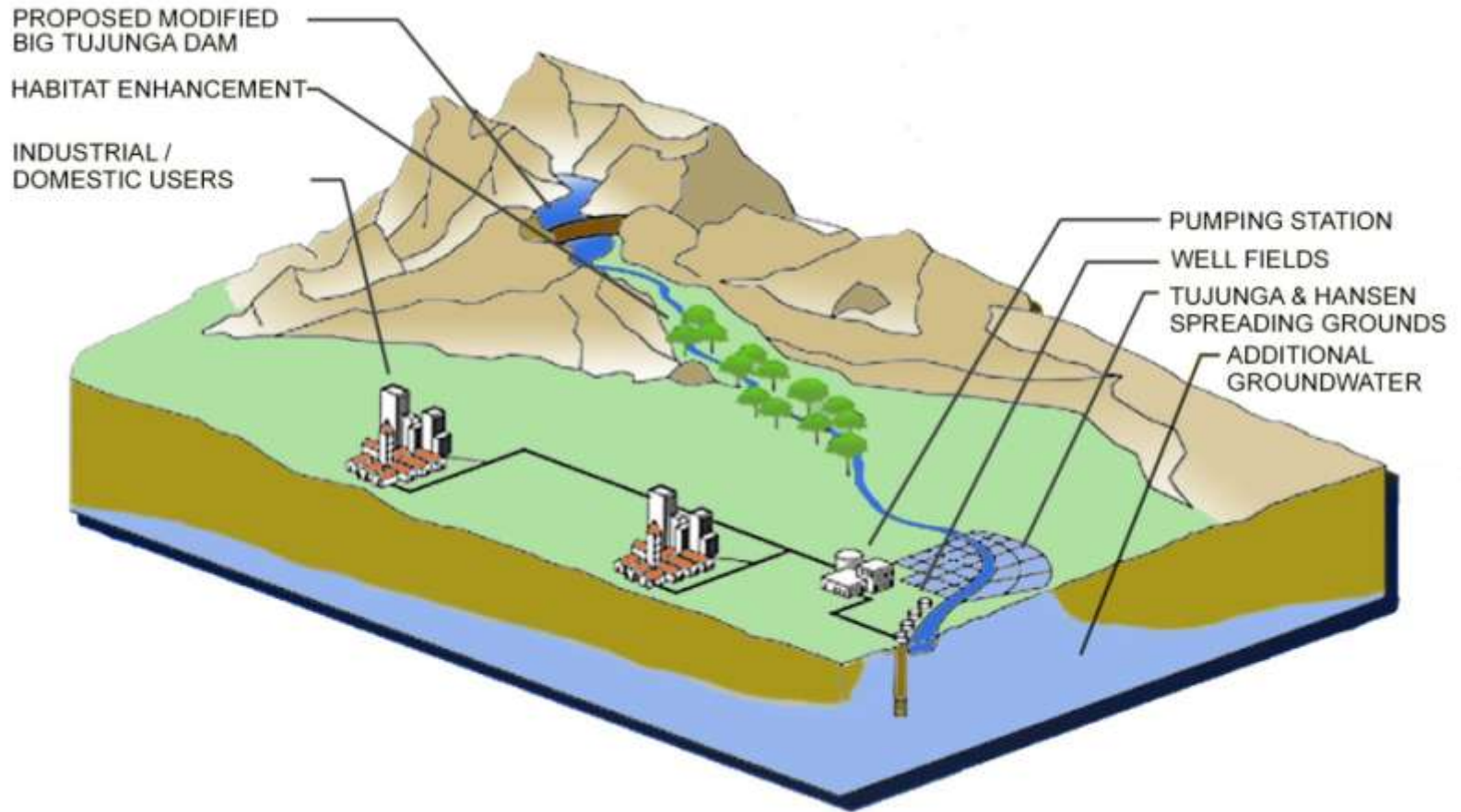
# Environmental Process

- Started the CEQA/NEPA process in October 2005
  - Finalize IS/MND in February 2006
  - Finalized EA in May 2006
- Environmental Permits
  - CDFG, USACE, RWQCB, USFS

# Water Conservation Benefit

- Increased conservation of water otherwise lost to ocean
- Sustainability of Local Water supply
- Reduced reliance on imported water
- 16,000 acre-ft of runoff enters Big Tujunga Reservoir annually
- Additional 4,500 acre-ft can be conserved annually if full rehabilitation

# Water Conservation



# Future Spillway Dam? Additional 705 Acre-feet





# Project Benefits

- Flood Control
- Improved Dam Safety
- Environmental Enhancement
- Water Conservation
  - 4,500 acre-ft per year on average
  - Potential for additional 705 ac-feet capacity

# Funding

Final Construction Cost \$98.4 million

Cooperative Funding : \$34.5 million

- State OES/FEMA Hazard Mitigation Grant
  - \$7.3 Million (\$1.9 Million reimbursed for design)
  - \$10.1 Million additional based on revised BCA
- State DWR Proposition 13 Groundwater Storage Grant
  - \$6.6 Million
- City of Los Angeles Department of Water and Power
  - \$9.0 Million
- Rivers and Mountain Conservancy-Prop 84
  - \$1.0 Million
- Santa Monica Mountains Conservancy/Regional Parks and Open Space District – Proposition A
  - \$0.5 Million

# Construction Award

- March 2007 - Big Tujunga Seismic Rehab RFP  
4 potential Bids
- June 2007 Board of Supervisors approves \$88.5 Million award to Shimmick Construction
- July 2007 Board of Supervisors approves \$2 Million Construction Services Contract to MWH (Designers).



MAR 28 2008











APR 8 2008

# Drill and Shoot

- Baxter Drilling
- 10' lifts
- 2.0 Max Peak Particle Velocity
- 3 seismographs
- 11 shots R. Abutment
- 12 shots L. Abutment



















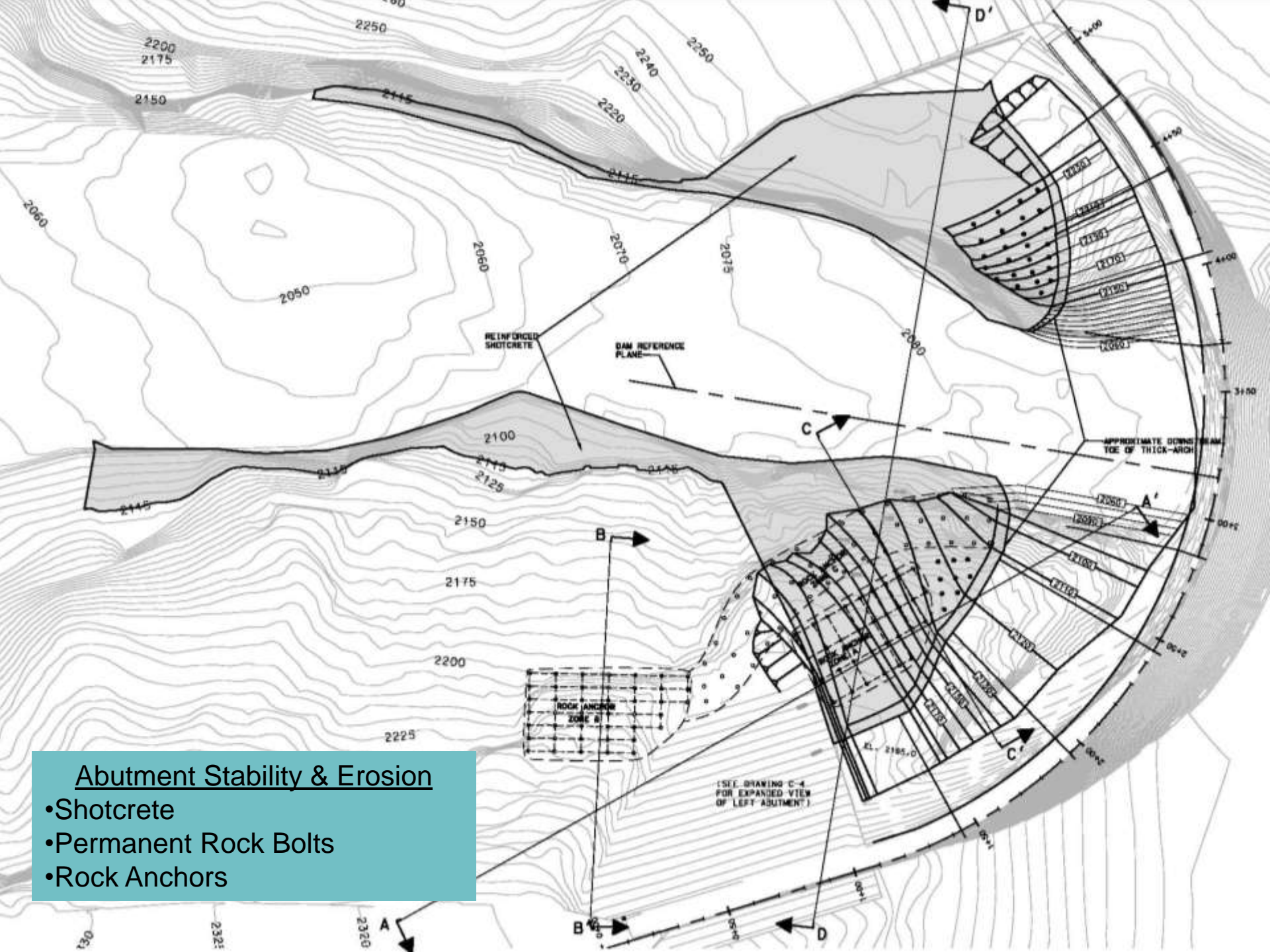
## Slope Protection for Plunge Pool

- Rock Dowels
- Shotcrete
- Drains
- Permanent Rock Bolts
- Temporary Rock Bolts
- Rock Anchors



## Abutment Stability & Erosion

- Shotcrete
- Permanent Rock Bolts
- Rock Anchors





































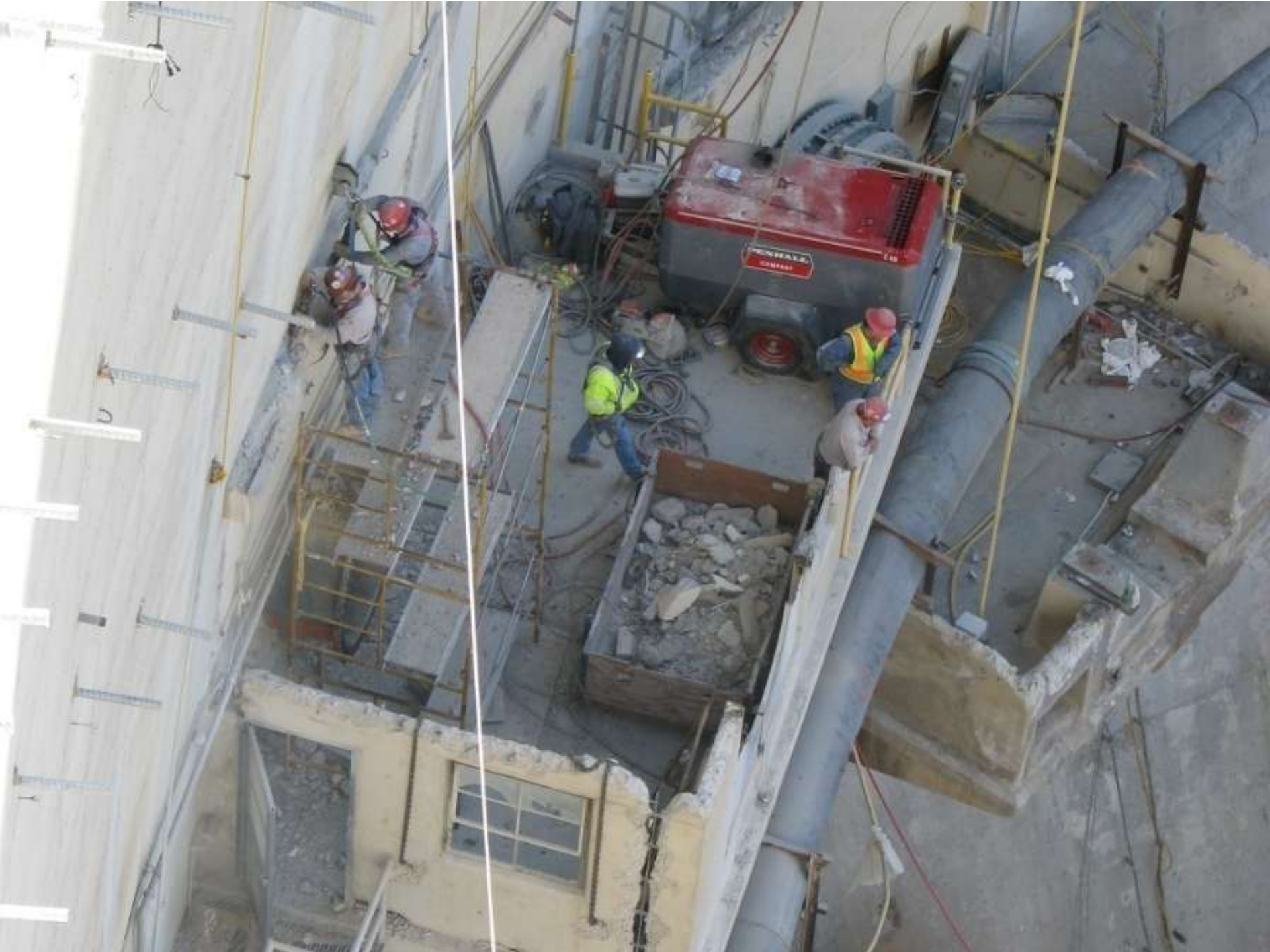




11/17/2008 20:27









# Elevator Demolition

August 5, 2008

















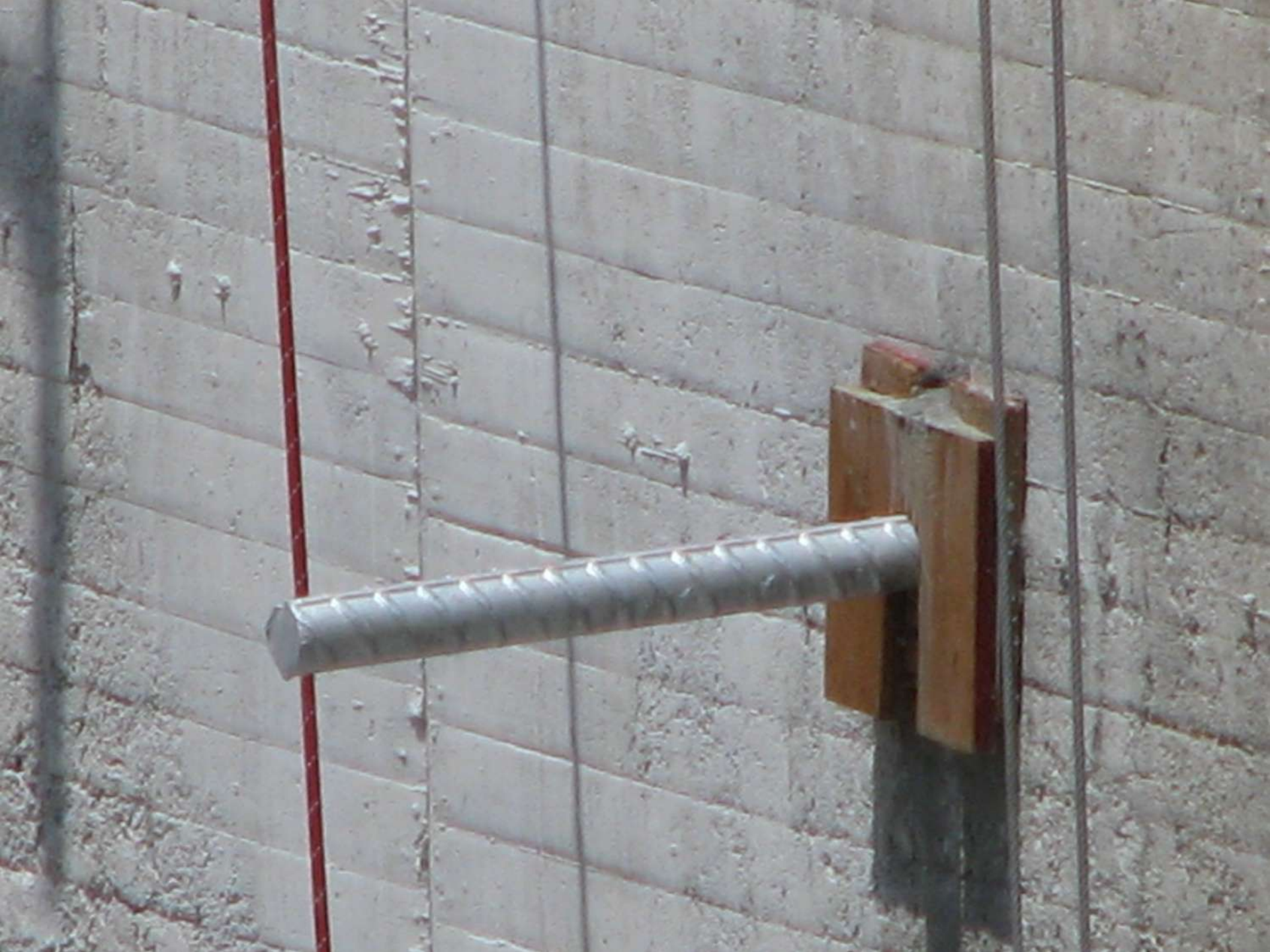




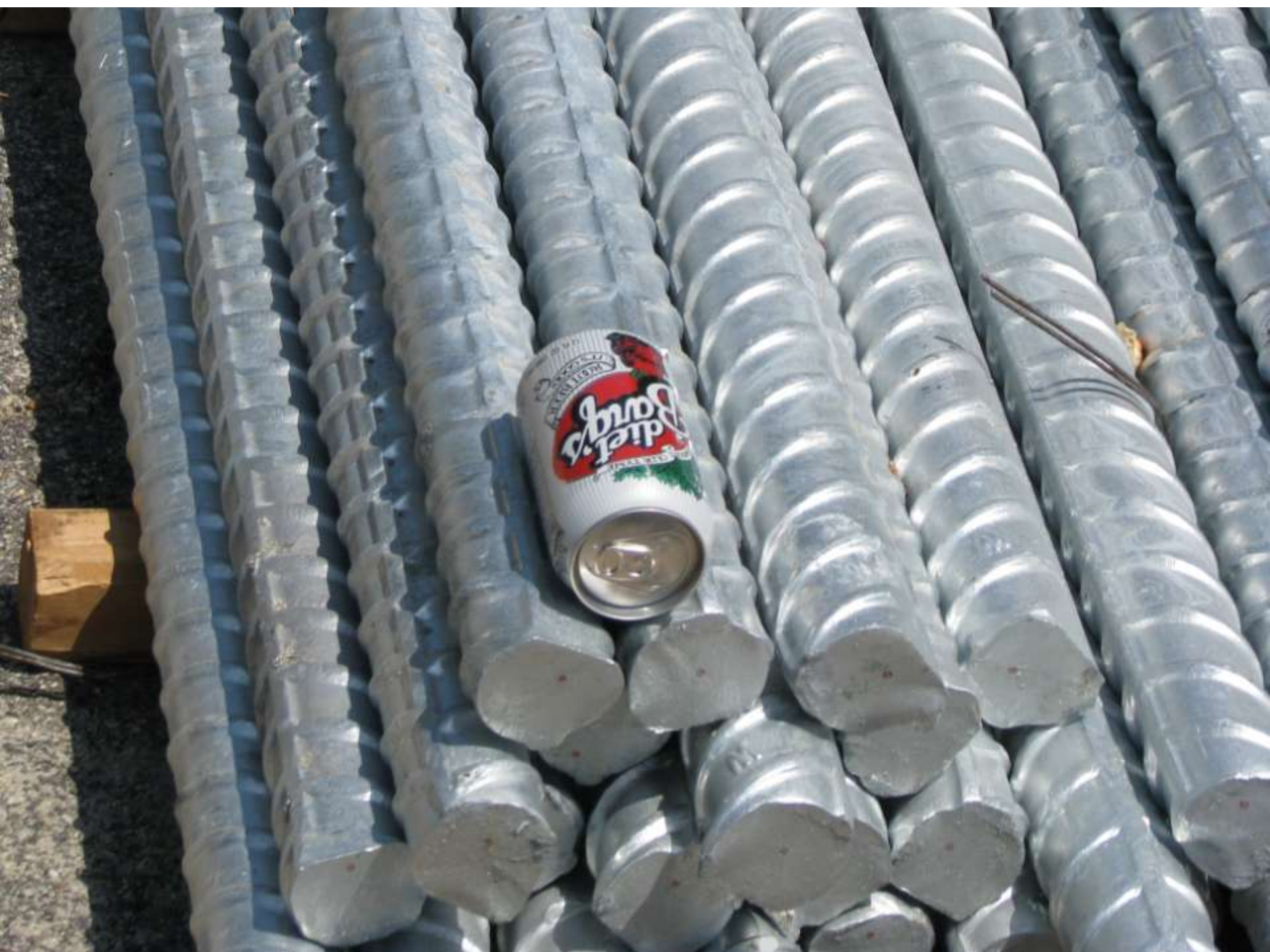
Water Diversion Pipeline













# Consolidation Grouting

- 3:1 neat mix - 15 psi
- Closure Criteria 0.5 sack/ft of hole
- Artesian Pressure in the valley
- Changed to a stable mix (including Bentonite and Super P).



Foundation Drilling and  
Grouting Program



## Foundation Consolidation Grouting



Uplift Monitoring  
During Foundation  
Drilling and  
Consolidation  
Grouting Program



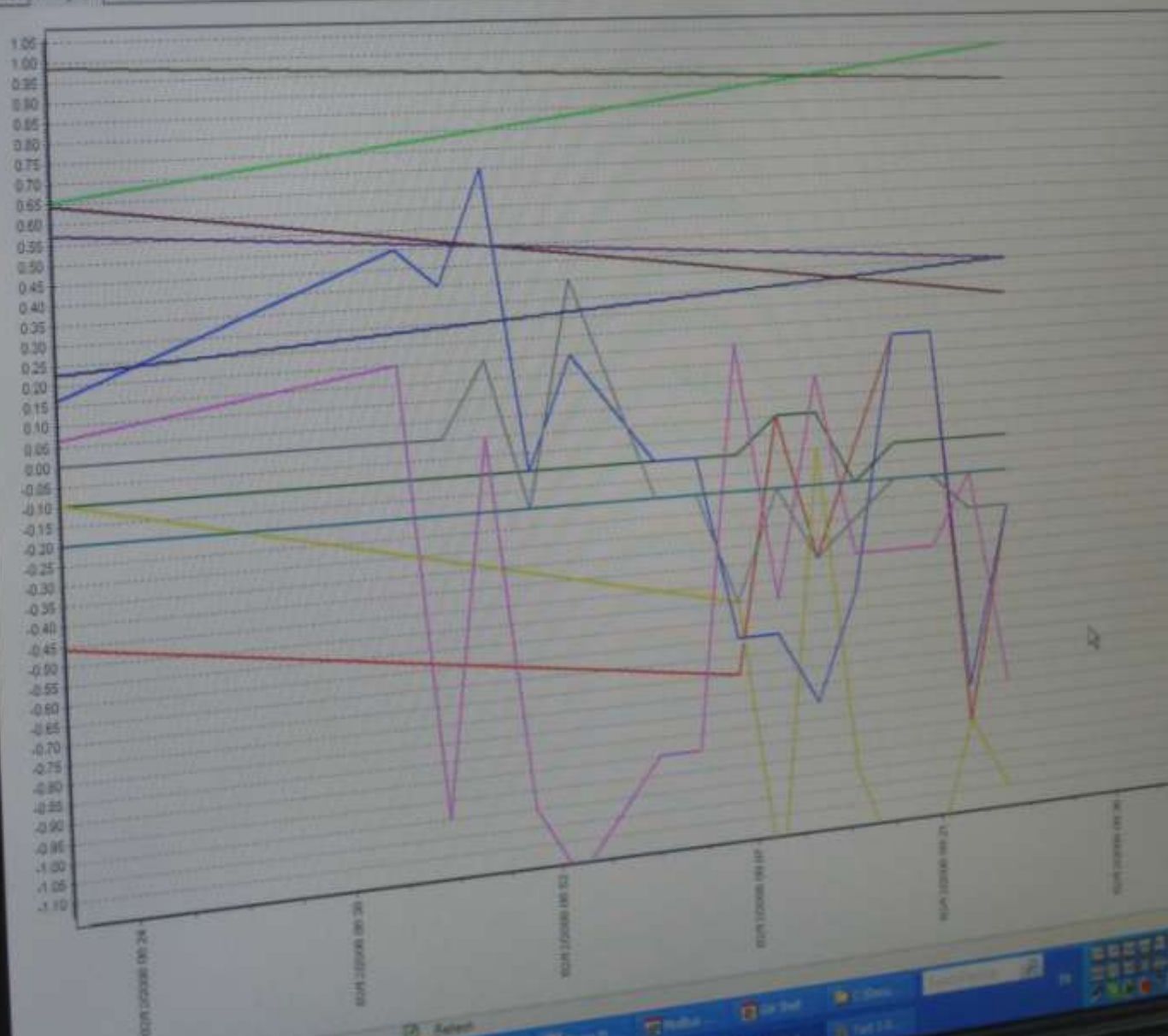




Detailed values [after 17/11/2008 09:27]

60 s Auto refresh

Values Time graph



Sol Data







## Drilling and Grouting from Platform Suspended from Crane





## Spider Drill on Left Abutment

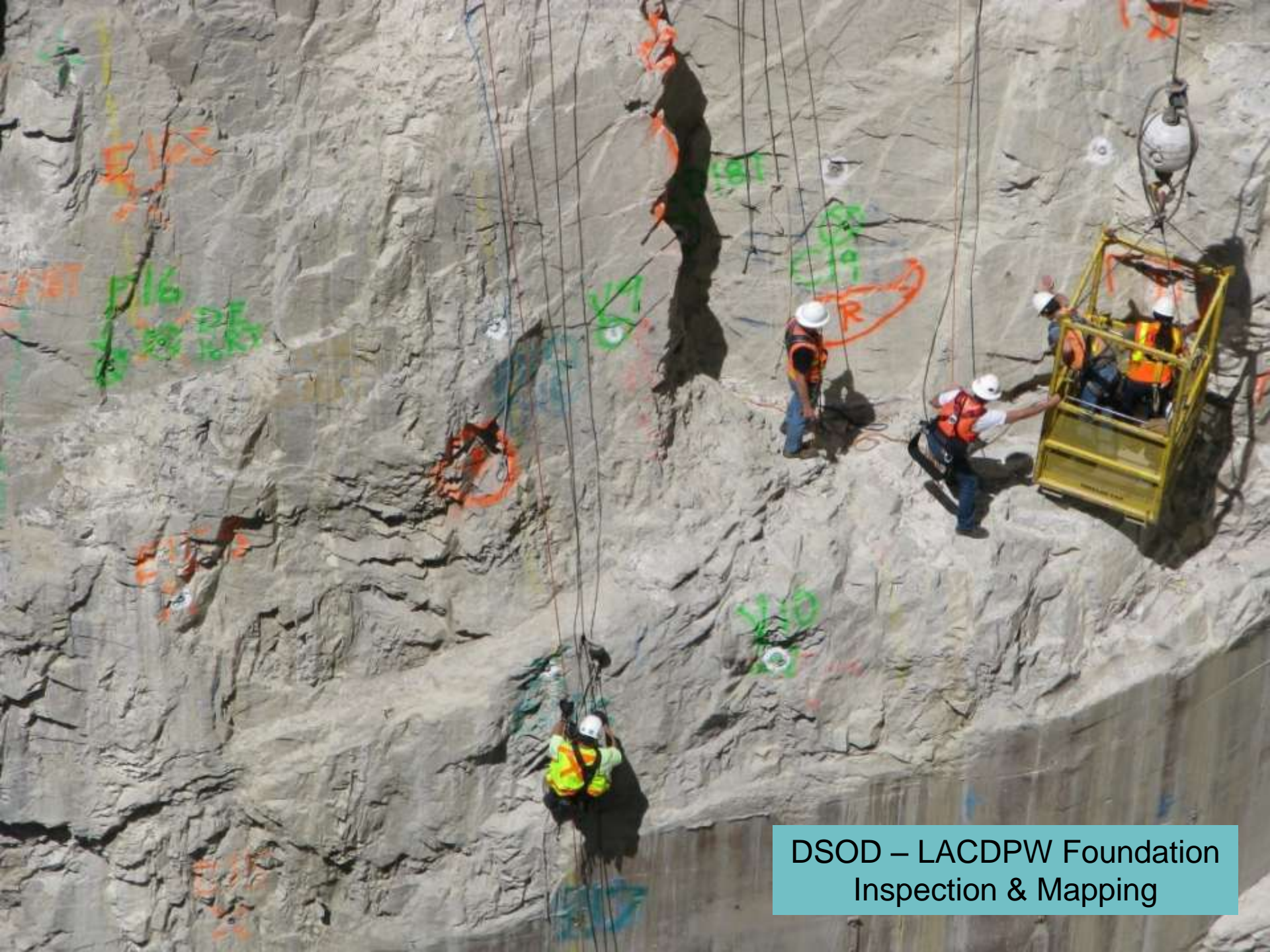






Post Grout Cleanup





DSOD – LACDPW Foundation  
Inspection & Mapping

# Dental Excavations

R – Remove Loose Rock  
E – Excavate Shear Zones  
for Dental Concrete  
D - Dental Concrete Fills







## Dental Excavations

- R – Remove Loose Rock
- E – Excavate Shear Zones for Dental Concrete
- D - Dental Concrete Fills



April 27, 2009

DSOD Approves  
Dam Foundation for  
Application of  
Dental Treatments  
(Dental Concrete  
and Slush Grout)





April 29 & 30, 2009

Pneumatically placed dental concrete placed on left and right abutments.

Cleaning Dental  
Concrete Over-spray





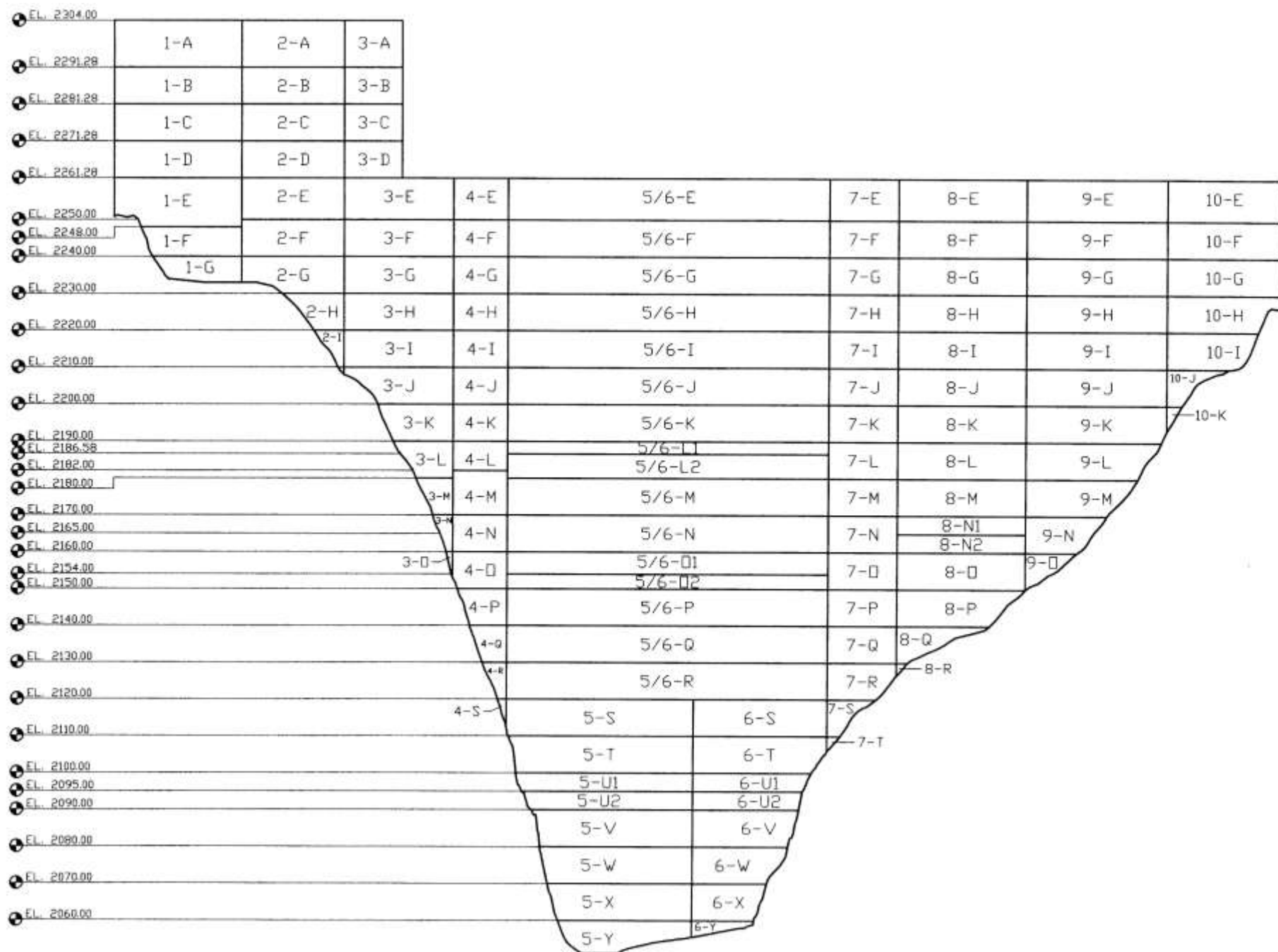
May 4, 2009  
DSOD Approves  
Dental Shotcrete  
Treatments and  
Foundation for Mass  
Concrete Placement



## Night Shift Sand Blasting of Existing Dam Continues









1/21/2009 10:17am









1/21/2009 9:34am



## Concrete Post - Cooling





## Access Pad Formwork First Mass Concrete















Excavator with 6 – 4.5 inch  
Concrete Vibrators







Block 5-X, 1:00 AM Start Time





## Cooling Pipe Installed, Final Cleaning





# Thermocouples



















## Status of Progress: August 12, 2009

- Top of Blocks; 04-S, 05-S, 06-T, and 07-T Visible
- Preparation underway for Placement of Block 06-S at 2:00 AM, August 13, 2009.





JUN 10 2009



3/23/2010 9:44am



















8/31/2009 10:16am



8/31/2009 10:21am





8/31/2009 10:36am









NOV 12 2009



NOV 21 2009









DEC 8 2008





JAN 14 2010



## 2009-2010 Winter Rains

- January 14, 2010 - LACDPW issues Demobilization Order for likely Spillway Flows
- January 17, 2010 to February 22, 2010 – Numerous rain storms cause closure of both Big Tujunga Canyon Road and Angeles Forest Highway.







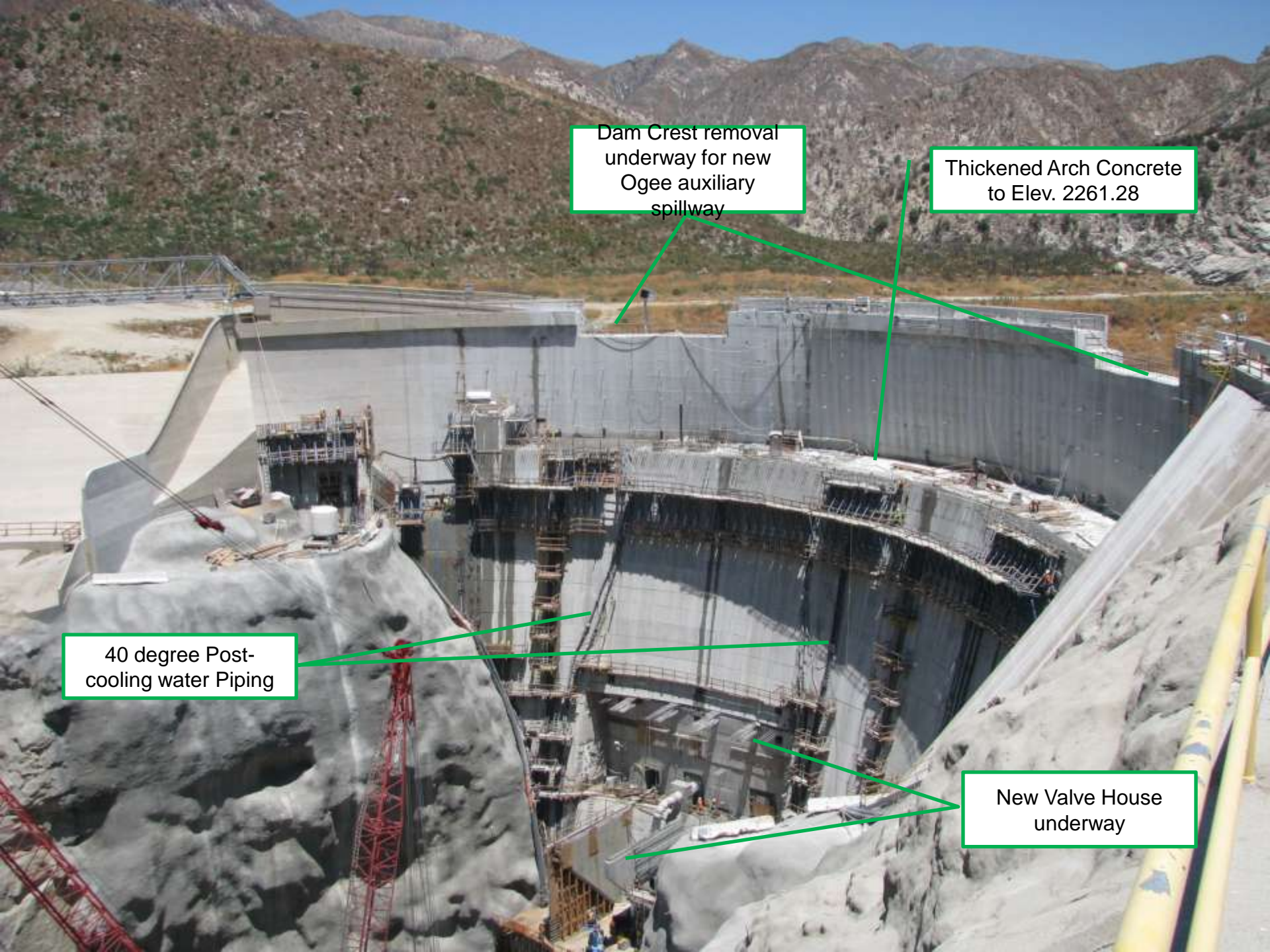












Dam Crest removal  
underway for new  
Ogee auxiliary  
spillway

Thickened Arch Concrete  
to Elev. 2261.28

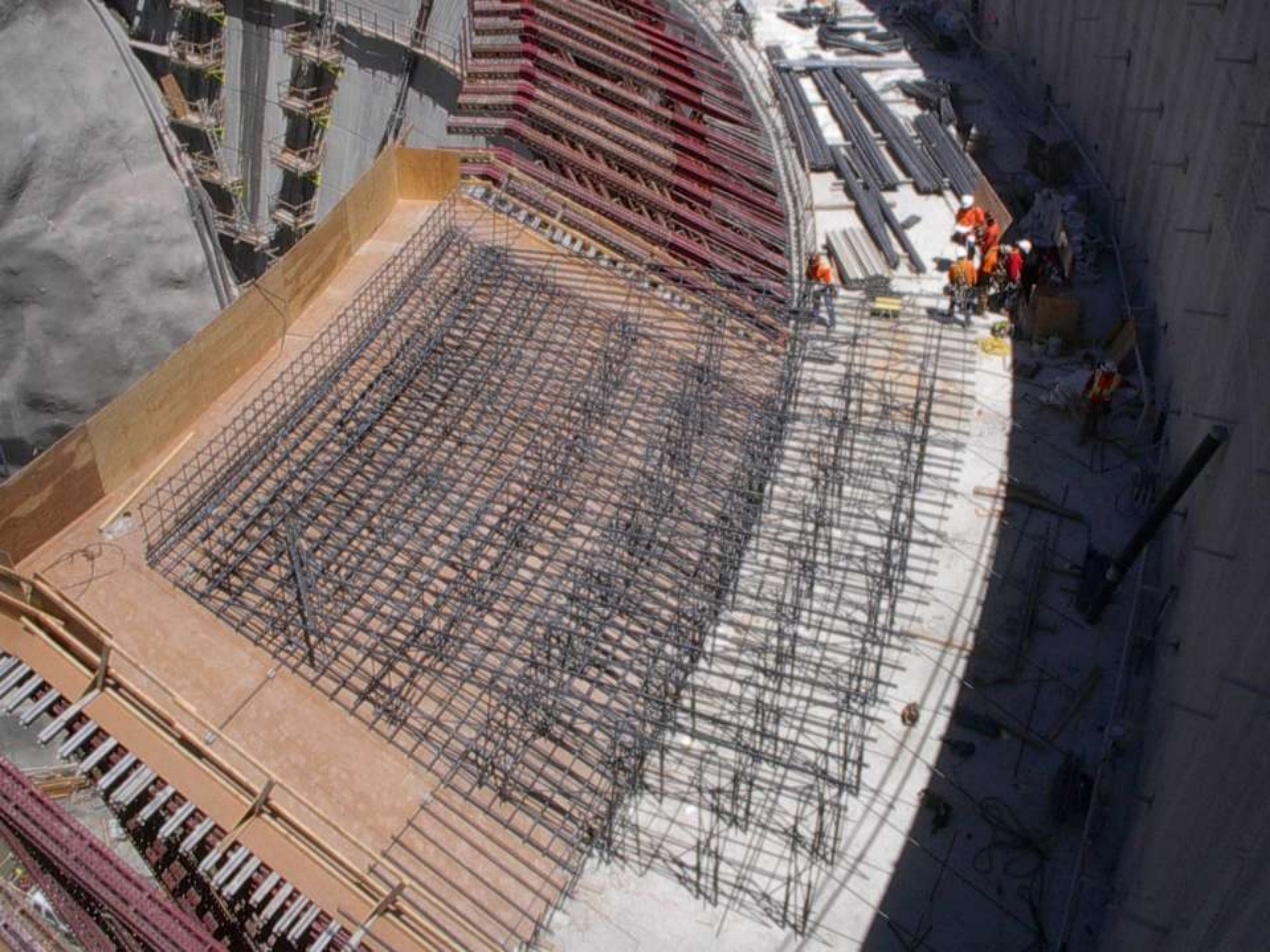
40 degree Post-  
cooling water Piping

New Valve House  
underway



















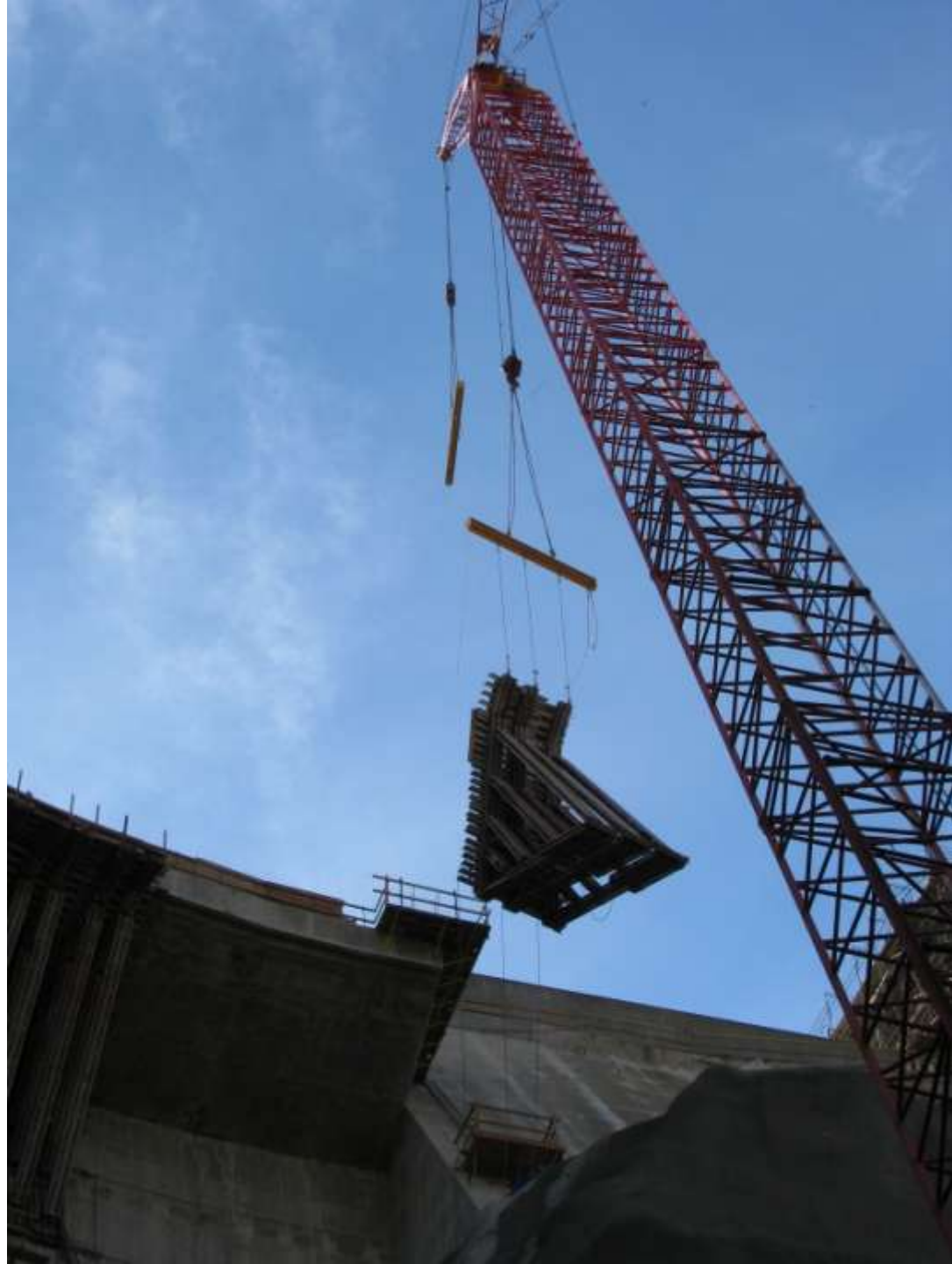












































# Gallery Drains



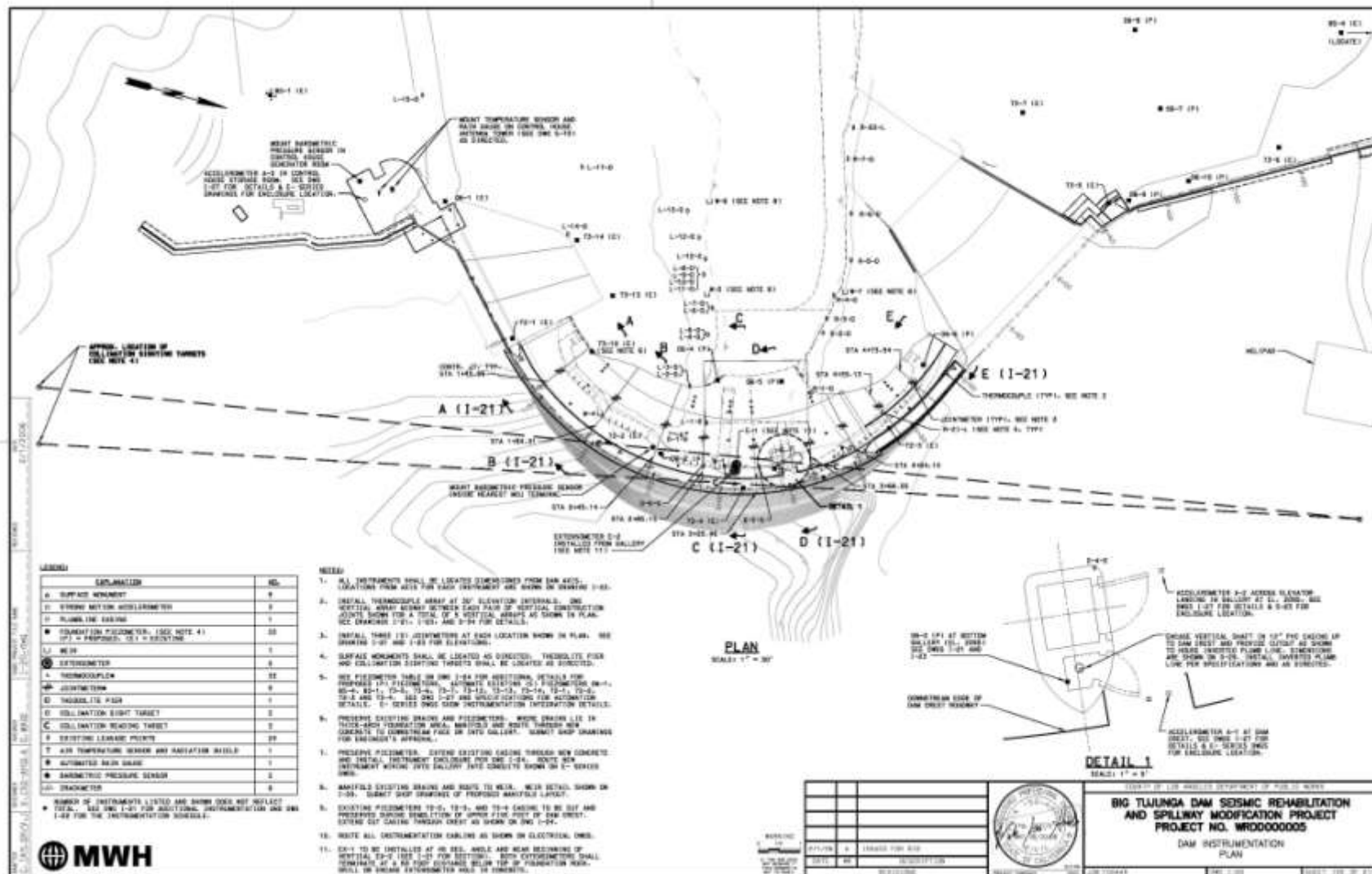


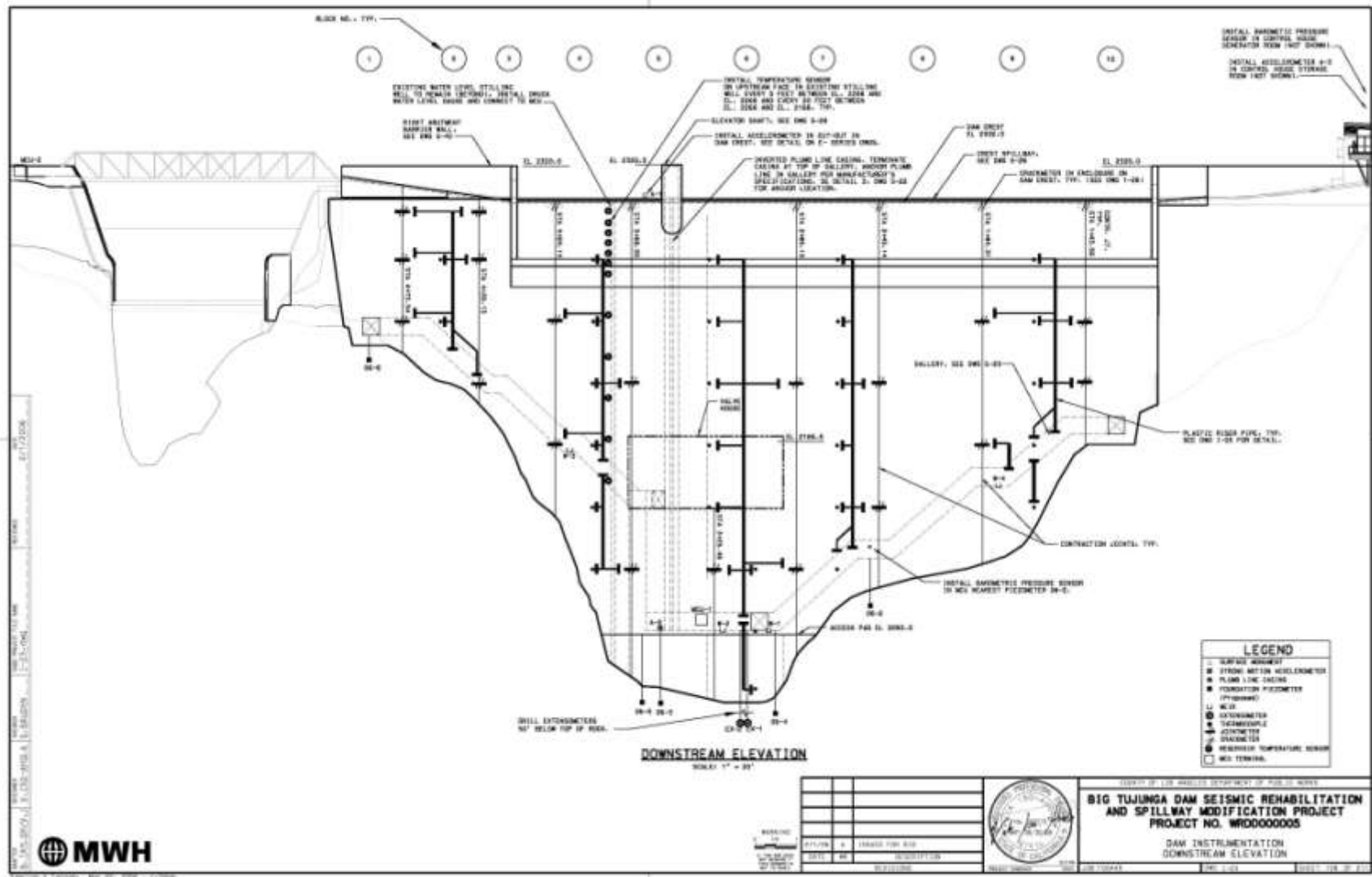




















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